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The Frequency and Direction of Desiccating Winds in England

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Abstract:

The frequency of desiccating winds in winter varies greatly between years and places. Eastern counties of England are particularly vulnerable; locally high frequencies elsewhere can be attributed to exposure. Western counties of England, sheltered from the east, record a considerably lower frequency. In all areas the months of January and February account for the vast majority of hours.

Shelterbelts may be erected to provide a general measure of protection with an optimum orientation of of 340°/160°, but the local landscape will produce individual characteristics for each site.

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Introduction:

Following two particularly severe winters during which many millions of pounds worth of nursery stock were killed or damaged, there has been renewed interest

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in winter protection techniques. More recently, however, the winter of 1987/88 proved to be one of the mildest on record and gives an admirable illustration of the variability of our winter weather.

Reflecting the heightened awareness among growers, ADAS have been involved in several trials to test the effectiveness of a variety of covering materials (Rowell, 1987; Mason and Rowell, 1988; Barrie 1987, 1988). These tend to be expensive and should be considered as part of a more general strategy involving, inter alia, the planting or construction of windbreaks and shelterbelts.

The cost/benefit of using tunnels to protect containerised stock will depend, in part, on the expected frequency of desiccating winds, while the siting of shelterbelts will depend on the direction from which the winds will most frequently blow.

The hourly weather records from six meteorological stations were analysed over the period 1971-88 to determine the frequency and direction of desiccating winds.

Results:

Based on the experience of plant losses in recent years the definition of a desiccating wind was chosen as an hour with

1. air temperature at or below $0^{o}C$, and
2. relative humidity at or below 80%, and
3. windspeed (10 m above ground) at or above 10 knots.

The annual totals of hours satisfying these criteria are given in table 1. Fig 1 shows the mean and third highest annual totals. At all six stations the majority of these hours occurred when the winds were blowing from between north and east.

Table 1

Frequency of hours with Temp $\leq 0^{o}$, RH $\leq$ 80%, Wind $\geq$ 10 knots

	Ringway	Gatwick	Shawbury	Wattisham	Watnall	Plymouth
71/72	16	6	0	36	2	12
72/73	3	0	2	5	2	0
73/74	3	9	0	44	8	0
74/75	0	1	1	1	3	0
75/76	55	62	33	64	63	18
76/77	15	0	0	2	5	0
77/78	33	35	21	50	25	22
78/79	107	78	48	94	33	66
79/80	7	2	1	13	7	5
80/81	15	12	8	28	14	0
81/82	63	51	8	63	50	23
82/83	21	33	7	29	12	21
83/84	6	0	0	2	3	0
84/85	90	115	14	116	51	73
85/86	84	127	101	156	87	126
86/87	48	63	8	45	10	99
Mean	35.4	37.1	15.7	46.7	23.4	29.1
S.D.(n-1)	34.9	41.9	26.5	44.2	26.0	39.8
Zero's	1	3	4	0	0	6
3rd highest	84	78	33	94	51	73
1987/88	0	0	0	5	4	0

The met. Station at Wattisham clearly records the highest totals, reflecting it's location close to the east coast. Gatwick during 1984/85 and 1985/86 produced two unusually high totals but in other respects has statistics similar to those from Ringway, which although further north, benefits from shelter in the lee of the Pennines. The lowest annual totals are found at the Midland stations, furthest from the east coast, Watnall and Shawbury. The

winter of 1985/86 stands out as remarkable at Shawbury with a total of 101 hours, over 6 times the value of the mean. After correcting for the positively skewed distribution (log transform) a total of 101 hours is to be expected once in 50 years). The results from Plymouth do not appear to fit the general pattern with a more polarised pattern of annual totals and a relatively high mean value. Local topography will probably explain this with a coastal exposure and local funnelling of winds down the valley of the River Plym combining to produce generally higher wind speeds, especially with winds blowing from the critical NE sector.

For three of the Met. Stations, Plymouth, Shawbury and Wattisham the wind directions associated with desiccating winds were examined in greater detail (fig 2). At all 3 stations the quadrant 20° to 110° accounted for the vast majority of hours with a secondary peak between 290 and 350° appearing at Shawbury and Wattisham. Neither Wattisham nor Shawbury are affected by strong local features, unlike Plymouth, indicating that any particular site should be assessed by its general exposure to winds from the NW through N to SE before site-specific advice is given.

Conclusions:

1. The sequence of 3 winters 1984/85, 85/86 and 86/87 produced the highest totals of desiccating winds since at least the winter of 1971/72.

2. The winter of 1987/88 produced the lowest totals since 1974/75.

3. The quadrant between 20° and 110° accounts for most of these winds, but

4. Local topography can shift or amplify the crucial wind quadrant.

5. Shelterbelts planted 160/340° will give best overall protection.

References

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Barrie, I.A. 1988 Winter protection of container grown hardy nursery stock. Chief Scientist Group Report L/L1/FNO2/002: in preparation

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Fig. 1.

Mean and 3rd Highest Annual Total of Desiccating Winds in England 1971/72 – 86/87

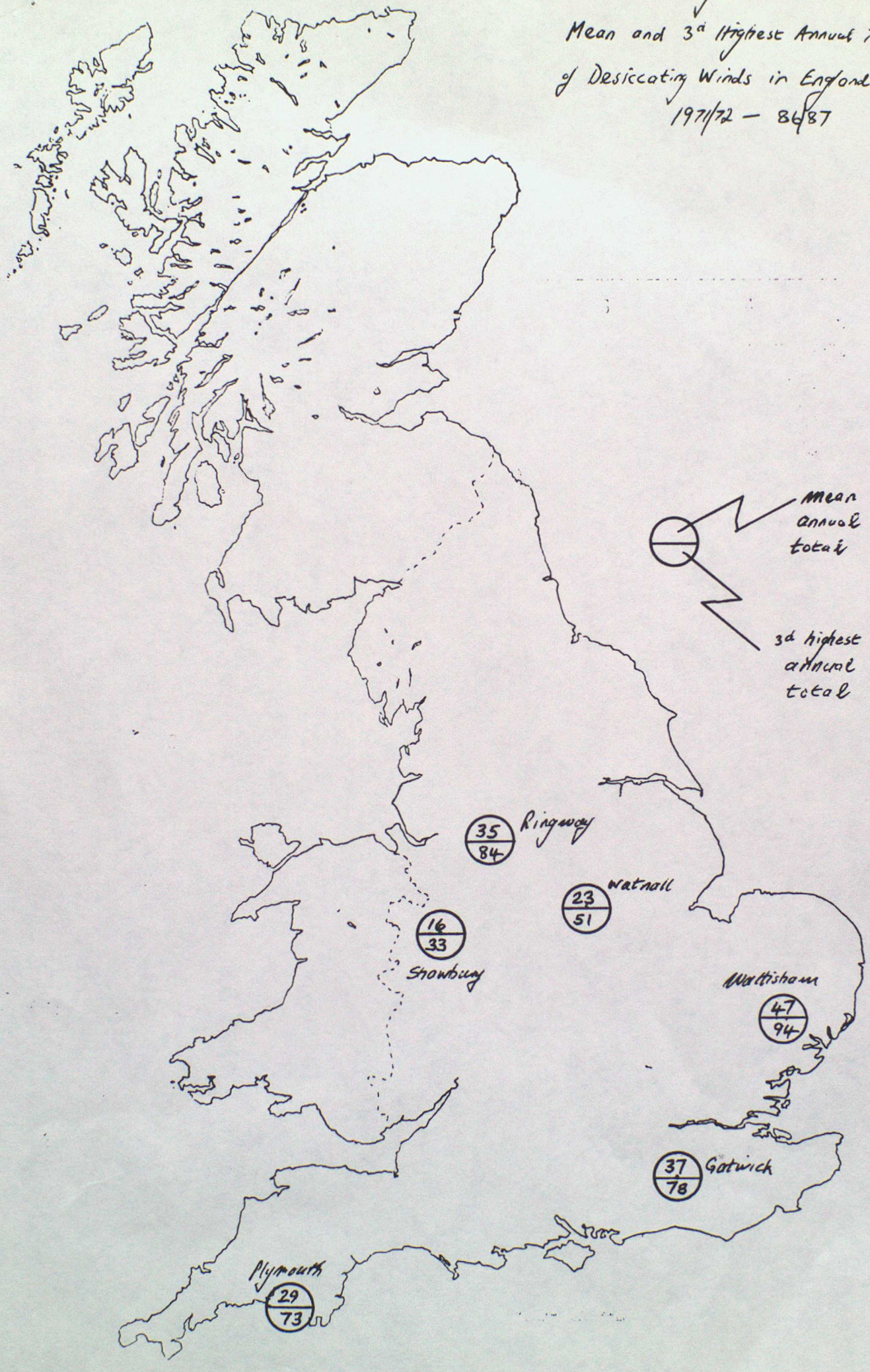
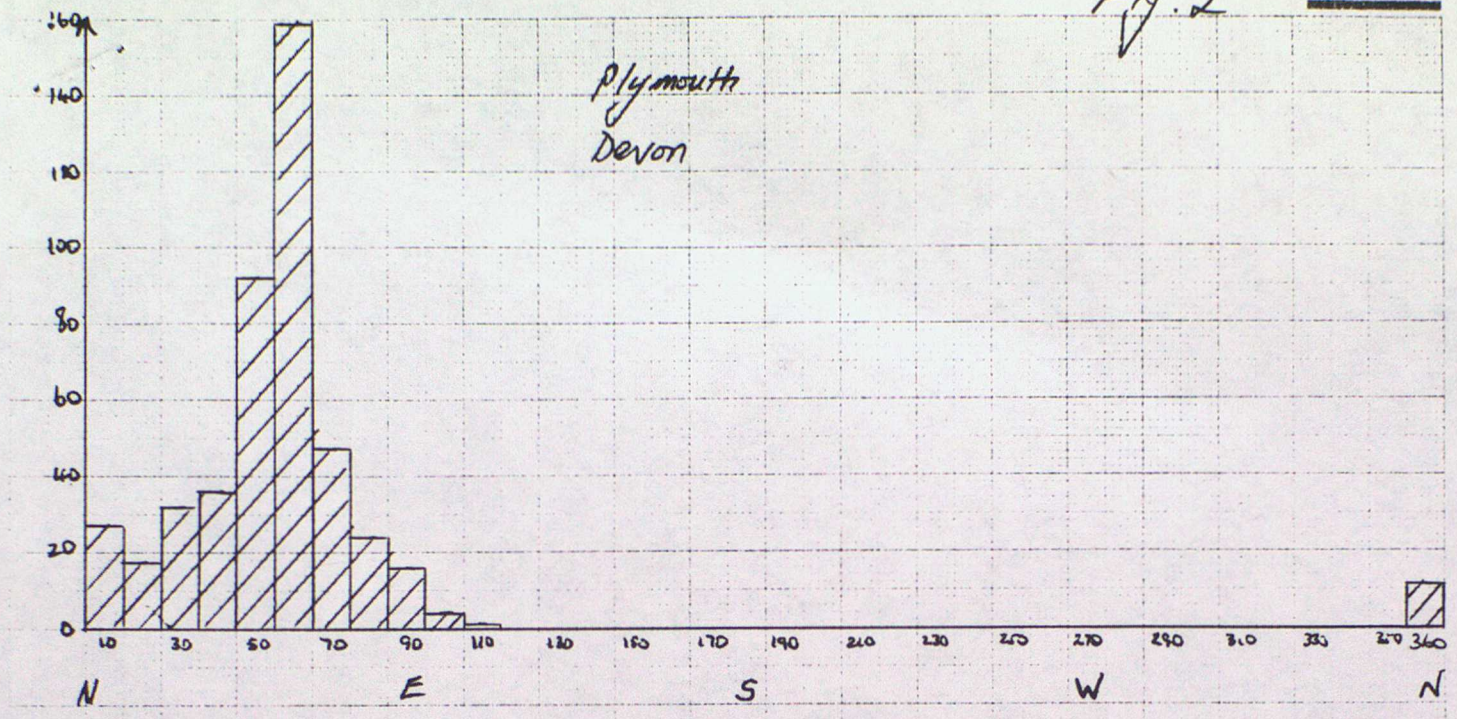
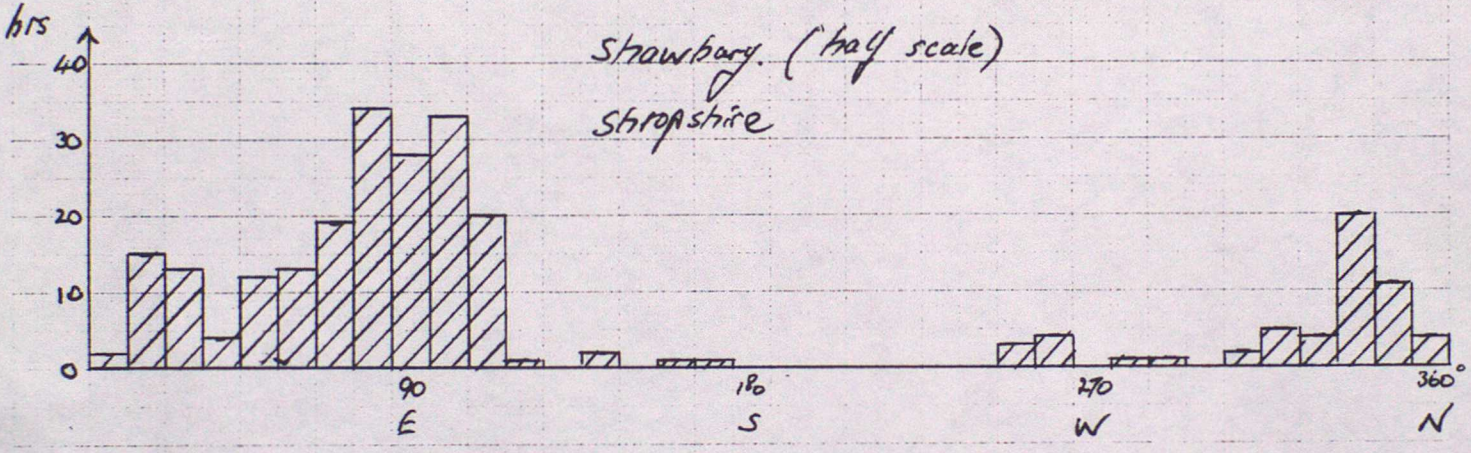
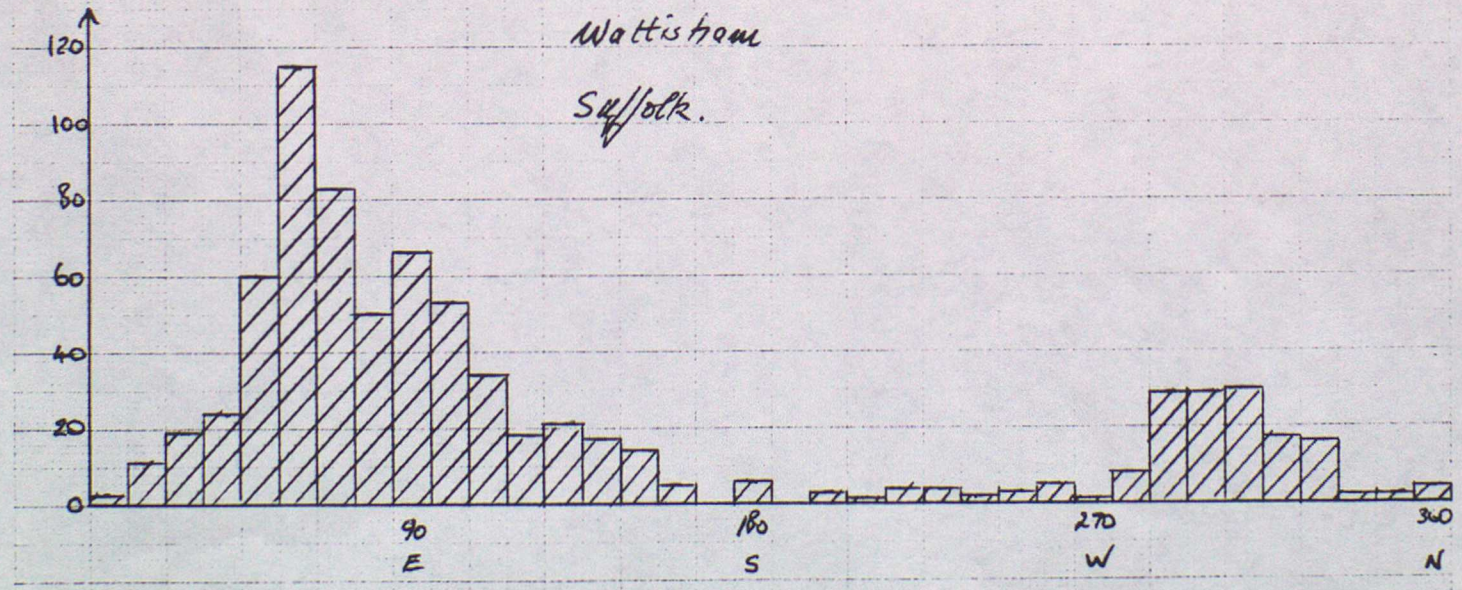


Fig. 2







17 year totals of dry freezing winds by direction.